

Market Trials VI: DAM Benchmarking

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DRAFT: For Discussion Purposes Only

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OVERVIEW

The DAM run, conducted as a part of Market Trial VI, was a benchmarking test that sought to compare the Market Trial results against the actual observed DAM market results from June 17th, 2004.

This presentation looks at what was the same and what different from the perspective of:

- the inputs to the two DAM runs; and,
- the resulting schedules and prices that came out of the two DAM solutions.

MODEL INPUTS

The NYISO spent a lot of time making sure that the bids considered by the new version of the SCUC model were consistent with the original SCUC run:

- Generation resources that did not bid reserves in the original SCUC were submitted to this simulation as ISO-Committed fixed resources, even if in other simulations to-date, they may have been bidding as ISO-Committed flexible;
- Manipulation of other elements of generation resource bids and unit status were necessary to allow for consistent treatment of all resources between the two SCUC runs;
- Imports, exports, wheels, and virtual trading were carried across from the original run to the new run;

MODEL INPUTS (cont.)

Market Trial VI, DAM Run, Model Inputs (cont.)

- Forecast loads were determined relative to the original SCUC run and were reduced to account for the fact that the revised loss modeling logic in the new SCUC would calculate and add in the losses associated the load forecast, whereas the original SCUC solution considered the losses to already be factored into the forecast as it made any forecast load commitments;
- Fixed bid loads were passed across unchanged so that the load schedules resulting from the benchmarking run would match the load schedules from the original SCUC run; and,
- Price sensitive load bids were passed across unchanged from the original SCUC model.

| DAM Hour | Number of Hourly Commitment Status Changes: Committed originally but not in the trial | Number of Hourly Commitment Status Changes: Committed in the trial but not originally |
|----------|--|--|
| 4 | 0 | 0 |
| 5 | 0 | 0 |
| 6 | 0 | 0 |
| 7 | 0 | 0 |
| 8 | 0 | 0 |
| 9 | 0 | 0 |
| 10 | 0 | 0 |
| 11 | 0 | 0 |
| 12 | 0 | 0 |
| 13 | 3 | 0 |
| 14 | 0 | 0 |
| 15 | 0 | 0 |
| 16 | 0 | 0 |
| 17 | 0 | 0 |
| 18 | 0 | 0 |
| 19 | 0 | 0 |
| 20 | 0 | 0 |
| 21 | 0 | 0 |
| 22 | 0 | 0 |
| 23 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 1 | 0 |
| 2 | 0 | 1 |
| 3 | 0 | 1 |

Generators with schedules in the hour and have a UOL greater than or equal to 200 MW.

UNIT COMMITMENT COMPARISON

We prepared a summary unit commitment status file for each hour of the day that compares the individual unit commitment status for each unit larger than 200 MW in size for each hour of the DAM

- In general, the pattern of large unit commitment is very consistent throughout the day.
- There are 30-40 large units committed in each hour and the table illustrates only the differences.
- The units committed originally that were not committed in the market trials were the first and last hours of commitments associated with cycling units. These resources also had smaller minimum generation levels and would have been more susceptible to commitment changes as a result of other “noise” in the solutions
- The unit committed in the trial in hours 23 and 24 is an in-city unit committed in the bid load commitment pass

Final Zonal LBMP Differences by Hour (Market Trial - Original in \$/MWh)

| Hour Ending | WEST | GENESE | CENTRL | NORTH | MHK VL | CAPITL | HUD VL | MILLWD | DUNWOD | N.Y.C. | LONGIL | H Q | NPX | O H | PJM |
|-------------|-------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|-------|-------|--------|-------|
| 1 | -1.50 | -0.66 | -1.85 | -3.12 | -2.25 | -2.49 | -4.30 | -3.89 | -3.32 | 3.94 | 3.60 | -2.99 | -3.20 | -1.96 | 0.45 |
| 2 | -1.58 | -1.13 | -2.08 | -3.10 | -2.42 | -2.76 | -3.80 | -3.50 | -3.99 | -0.43 | 2.36 | -2.96 | -3.42 | -2.05 | 0.57 |
| 3 | 1.15 | 1.55 | 0.49 | -0.51 | 0.13 | -0.15 | -1.18 | -0.62 | -1.01 | 6.78 | 1.28 | -0.32 | -0.80 | 0.61 | 3.48 |
| 4 | 0.26 | 0.88 | -0.09 | -0.68 | -0.31 | -0.72 | -1.82 | -1.26 | -1.70 | 4.00 | 1.46 | -0.47 | -1.36 | -0.12 | 2.44 |
| 5 | 0.01 | 0.57 | -0.39 | -1.02 | -0.64 | -1.04 | -2.10 | -1.60 | -1.95 | 3.74 | 1.44 | -0.83 | -1.70 | -0.42 | 2.17 |
| 6 | 1.23 | 1.72 | 0.65 | -0.47 | 0.30 | 0.06 | -0.90 | -0.34 | -0.75 | 9.82 | 1.74 | -0.27 | -0.58 | 0.70 | 3.49 |
| 7 | -7.48 | 7.16 | 3.97 | 2.28 | 3.42 | 2.64 | 1.22 | 1.97 | 1.23 | 2.87 | 1.75 | 2.14 | 1.45 | -9.57 | 2.22 |
| 8 | -1.70 | 4.14 | 1.46 | -0.96 | 0.74 | 0.64 | -0.48 | 0.33 | -0.46 | 3.15 | 0.74 | -0.03 | 0.03 | -2.27 | 2.96 |
| 9 | 0.54 | 1.60 | 0.05 | -1.87 | -0.41 | -0.32 | -1.21 | -0.32 | -1.24 | 8.70 | 1.68 | -1.26 | -1.38 | 0.21 | 2.35 |
| 10 | 2.09 | 3.85 | 2.61 | 0.36 | 2.06 | 1.99 | 1.06 | 1.99 | 0.98 | 14.96 | 4.68 | 0.79 | 0.87 | 1.77 | 4.52 |
| 11 | 0.88 | 1.80 | 0.20 | -2.62 | -0.66 | -0.87 | -1.79 | -0.76 | -1.94 | 18.04 | 5.91 | -2.21 | -1.95 | 0.43 | 2.16 |
| 12 | -0.62 | 0.80 | -0.64 | -2.46 | -1.13 | -1.43 | -2.39 | -1.44 | -2.66 | 15.67 | 8.36 | -2.19 | -2.64 | -0.87 | 0.98 |
| 13 | 0.40 | 2.02 | 0.72 | -1.28 | 0.37 | 0.25 | -0.64 | 0.44 | -0.79 | 18.57 | 11.04 | -0.97 | -0.89 | 0.08 | 2.12 |
| 14 | -1.87 | -0.68 | -2.30 | -4.79 | -2.97 | -3.36 | -2.72 | -1.06 | -2.46 | 25.14 | 17.11 | -4.69 | -3.94 | -2.56 | 0.13 |
| 15 | -2.69 | 0.00 | -1.69 | -4.26 | -2.44 | -3.64 | -7.00 | -5.81 | -7.45 | 13.38 | 13.04 | -4.24 | -6.07 | -3.54 | 1.98 |
| 16 | -2.16 | 1.98 | -0.79 | -5.16 | -2.47 | -4.86 | -2.13 | 1.92 | 0.22 | 10.09 | 11.43 | -5.00 | -4.19 | -3.88 | 8.99 |
| 17 | -0.52 | 4.09 | 1.24 | -3.64 | -0.69 | -2.99 | -1.70 | 1.95 | 0.29 | 10.06 | 11.32 | -3.43 | -2.93 | -2.51 | 11.27 |
| 18 | 0.67 | 4.19 | 1.74 | -3.00 | 0.05 | -1.81 | -5.12 | -3.28 | -4.88 | 9.34 | 11.54 | -2.70 | -3.96 | -0.96 | 10.95 |
| 19 | 2.23 | 4.30 | 2.45 | -1.25 | 1.39 | 0.56 | 2.29 | 4.45 | 3.28 | 20.80 | 13.88 | -0.65 | 0.73 | 1.06 | 8.56 |
| 20 | 1.13 | 3.43 | 1.96 | -0.62 | 1.42 | 1.23 | 0.56 | 1.49 | 0.37 | 8.27 | 24.39 | 0.00 | 0.34 | 0.41 | 4.21 |
| 21 | 0.52 | 4.10 | 2.36 | -0.39 | 1.78 | 1.56 | 0.79 | 1.75 | 0.63 | 3.17 | 20.26 | 0.18 | 0.56 | -0.35 | 4.27 |
| 22 | -0.80 | 2.23 | 1.27 | -0.32 | 1.00 | 0.75 | -0.21 | 0.70 | -0.40 | 4.89 | 8.07 | 0.00 | -0.37 | -1.35 | 2.13 |
| 23 | -4.09 | -0.81 | -2.74 | -4.35 | -3.30 | -4.29 | -5.55 | -4.84 | -5.84 | -2.82 | 2.18 | 0.00 | -1.29 | -0.82 | 3.92 |
| 24 | -7.05 | 4.64 | 1.35 | -0.90 | 0.60 | -0.57 | -2.15 | -1.39 | -2.22 | 0.76 | 1.25 | -4.68 | -5.79 | -12.88 | -1.67 |
| Average | -0.87 | 2.16 | 0.41 | -1.84 | -0.27 | -0.90 | -1.72 | -0.55 | -1.50 | 8.87 | 7.52 | -1.53 | -1.77 | -1.70 | 3.53 |
| Minimum | -7.48 | -1.13 | -2.74 | -5.16 | -3.30 | -4.86 | -7.00 | -5.81 | -7.45 | -2.82 | 0.74 | -5.00 | -6.07 | -12.88 | -1.67 |
| Maximum | 2.23 | 7.16 | 3.97 | 2.28 | 3.42 | 2.64 | 2.29 | 4.45 | 3.28 | 25.14 | 24.39 | 2.14 | 1.45 | 1.77 | 11.27 |

MARKET OUTPUTS

The comparison of zonal prices between the two runs shows a number of differences in the prices.

- During the peak hours of the day, NYC and LI zonal prices are consistently higher in the market trial than in the original DAM solution.
- Prices outside of NYC and LI are either lower or higher, depending on location and time of day.

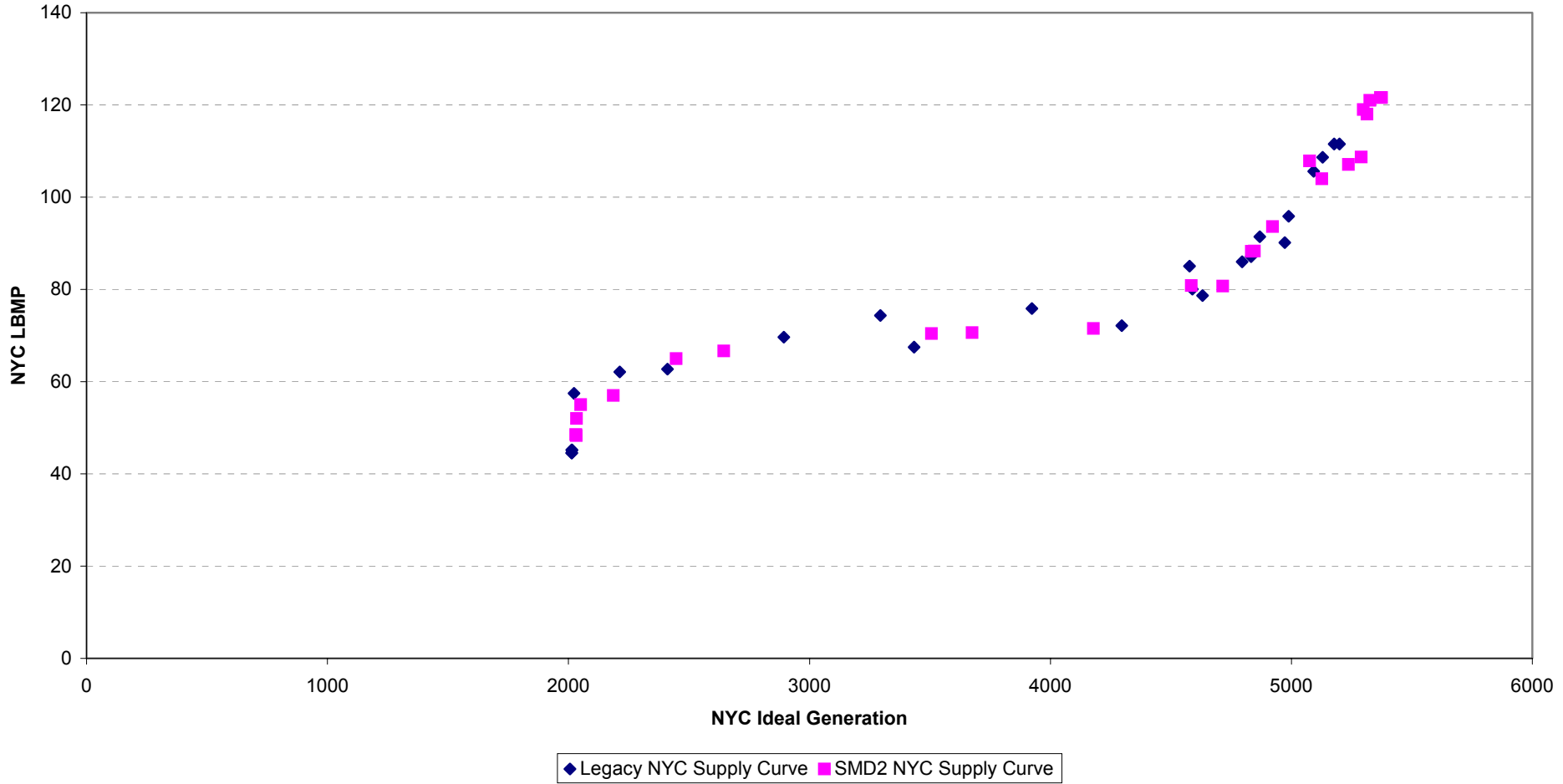
NYC and LI Zonal Prices

The chief cause of the price differences between the two runs relates to improvements in the loss modeling in the DAM.

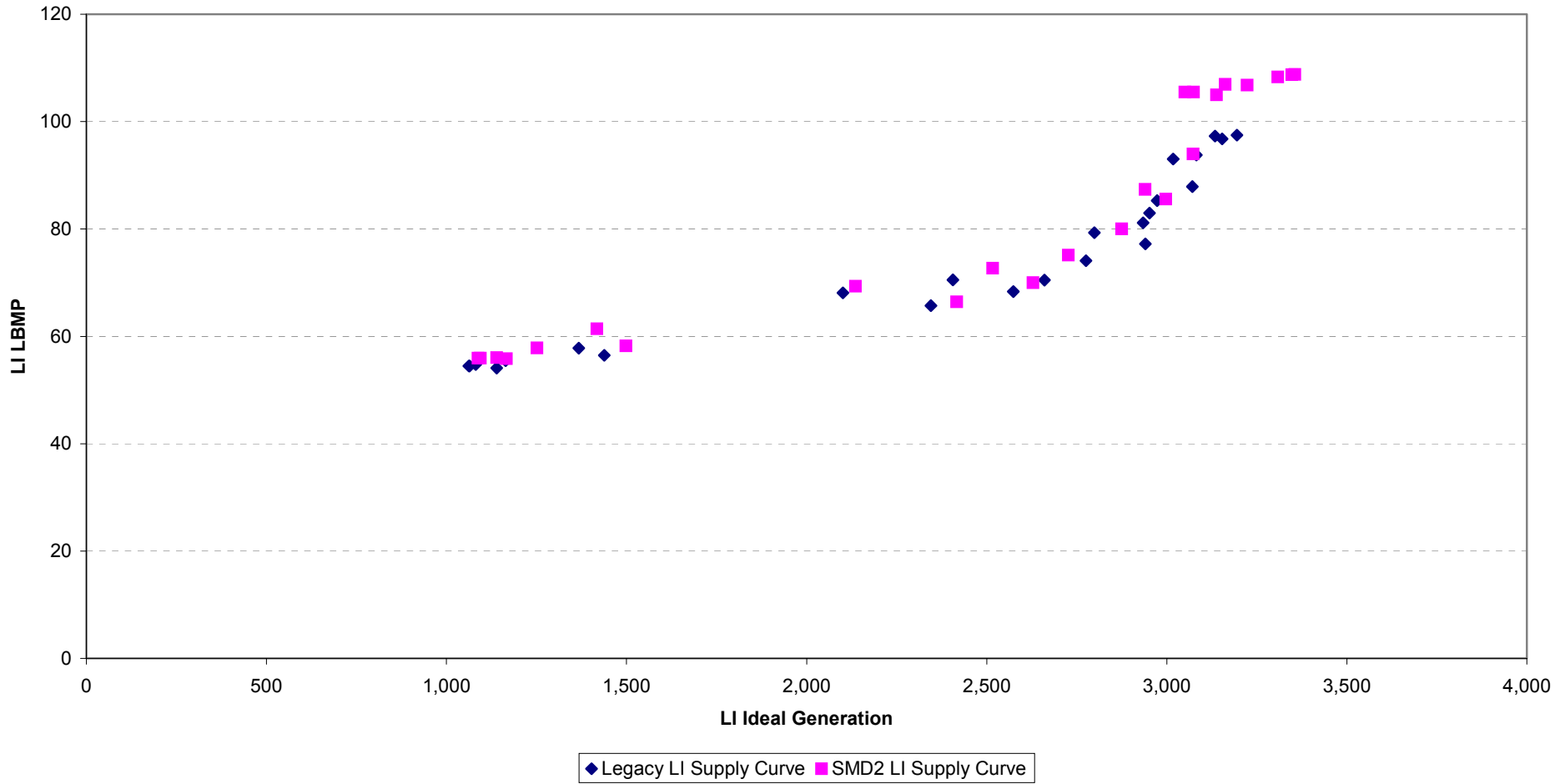
- Under the improved loss modeling approach, all losses associated with the dispatch of generation to meet fixed bid load are dispatched within the Day-Ahead generation solution.
- Particularly in the NYC and LI zones, the additional incremental generation causes the price to be somewhat higher.

In order to benchmark the two solutions, we prepared an implicit supply curve for units dispatched in NYC and LI that identified the total quantity of generation dispatched within the region in each hour of the both DAM solutions versus the zonal price observed in the region in the hour of each DAM solution.

NYC LBMP v Ideal Gen



LI LBMP v Ideal Gen



NYC and LI Zonal Price Difference

When viewed from the perspective of the necessary zonal generation dispatch required to meet cleared bid load, the comparison of the implicit supply curves shows supply curves for the two SCUC runs that are intermingled:

- At times the SMD P,Q pair is below the original P,Q pair; and,
- At times the SMD P,Q pair is above the original P,Q pair.

NYC and LI Zonal Price Difference

It is important to note that the price differential observed for the same level of served bid load is determined without the benefit of any changes in price-sensitive load bidding, virtual generation and load bidding, and import and export load bidding that would occur as a result of the loss modeling change.

The improvements to the loss modeling in the DAM do not impact the way in which RT prices are calculated. If the loss modeling changes result in DAM prices that are higher than RT prices, then physical loads will reduce DAM quantities, virtual loads will fall, and virtual generation will increase until that price differential is arbitrated away, i.e., DAM prices would naturally converge to the RT prices that are not impacted by the DAM loss modeling changes.

There is no way for us to simulate that effect within the benchmarking test.

Prices Outside of NYC and LI

Prices outside of NYC, particularly in Dunwodie, Millwood, and Hudson Valley, on average appear to fall, mostly as a result of decreased congestion across the Leeds-Pleasant Valley contingency constraint.

The additional generation dispatched further down stream in NYC and LI as a result of the loss modeling improvements reduces the congestion on the Leeds-Pleasant Valley constraint, tending to lower prices in the regions south and east of the constraint, but not in NYC or LI.

AMP Mitigation Comparison

The higher prices in the initial bid load pass caused the NYC price to exceed \$150/MWh and resulted in more extensive mitigation of bids in the market trial.

| Number of Generator-Hours of Incremental Energy Mitigation | | |
|--|-------------------|---------------|
| ZONE | 9/28 Market Trial | 6/17 SCUC Run |
| WEST | 0 | 0 |
| GENESE | 0 | 0 |
| CENTRL | 0 | 0 |
| NORTH | 0 | 0 |
| MHK VL | 0 | 0 |
| CAPITL | 0 | 0 |
| HUD VL | 0 | 0 |
| MILLWD | 0 | 0 |
| DUNWOD | 0 | 0 |
| N.Y.C. | 452 | 38 |
| LONGIL | 0 | 0 |